articulation, but simply a vowel sound first whispered and then pronounced aloud. Accent has for its object to make one syllable or several more prominent than those around. The English language tends to throw it as far back in a word as is practicable. A long word may have one strong, and one or even two weaker accents in it.

Inflexion is either rising, falling, or a compound of these. As a rule, rising tones appeal, falling tones assert, compound tones suggest; a complete balance of the two is the antithesis, which can be heard in such a remark as "It was not so much what you said—as your manner of saying it, which struck me." The contrasted effect of the two accents may be reproduced by reading this sentence aloud and intelligently.

When inflexion is applied in this way to sentences, three cases occur: the sentence either asserts, asks, or orders, and the nature of the inflexion depends on the relative circumstances of the speaker and listener.

Delivery and modulation are combinations of pausing and of pitch. The conversational pitch being taken as a medium, all below this denotes sadness or solemnity; all above it joy or levity. Force, expression, and sentiment, thus developed, are infinite in their variety.

Emphasis can only be attained and regulated by a full perception of the point to be brought out; as a rule it marks the predicate of a logical expression. False emphasis is the foundation of many quaint stories in common currency. Speaking generally, new, contrasted, or antithetical ideas are marked by emphasis.

In conclusion, the lecturer gave three general rules by which any one can speak. The first, in the words of Horace: "Dicendi rectè principium est sapere, et fons;" that is, "Know exactly what you are going to say." The second, "Endeavour to forget yourself." This frame of mind had been formulated by old elocutionists as "Have a contempt for your audience." He preferred to state it in a less obnoxious way as "Consider yourself one of your audience." The third, "Be natural and unaffected."

By bearing in mind these simple injunctions any man free of congenital or acquired defects, though he might not be a brilliant, could hardly fail in being an agreeable and sympathetic speaker.

PROFESSOR SCHIAPARELLI ON THE GREAT COMET OF 1882

READERS of NATURE will be glad to have a full report of the interesting popular lecture which Prof. Schiaparelli, the well-known Italian astronomer, gave in Milan on February 4, on the great comet of 1882. Referring to the national misfortune which had given origin to his and other lectures, he began by showing that while a connection between the comet and the inundations which wasted, in October 1882, many Venetian provinces, was not absolutely impossible, it was at least very improbable, both because the comet was yet a great distance from the earth when the floods rose, and from the difficulty of understanding why the supposed influence of the comet should have acted only on that little part of the globe. After this preamble M. Schiaparelli gave the public a rapid and elementary account of our planetary system, and of the comet's trajectory during its passage near the sun and planets. The orbit of the comet, in the position which could be subjected to astronomical measurement, is parabolic, in a plane inclined 30° or 40° to planes of the solar system. The greater portion of the orbit is in the southern regions; for in the austral hemisphere the comet was sooner and better observed than in the boreal, where it never was very high above the horizon. The vertex of the parabola is very near the sun, and only when the comet was approaching to this position with an extraordinary rapidity, astronomers could perceive it,—at Auckland (September 2), at the Cape of Good Hope, in Australia, the Argentine Republic, and Brazil. The direction of its movement was perhaps towards the sun; but the inconceivable rate which the comet acquired in its falling towards the sun (480 km. in a second, sixteen times the mean velocity of the earth in its orbit), and the lateral rush coming from it, were enough at that time to overcome the attractive power of the sun, and to hinder the great luminary from swallowing it. The attraction of the sun failed not to produce its effect, slackening successively its flight; but being animated by this great velocity, the comet could escape in security to where the sun's action is very feeble, and whence it will not return for many years.

The Cape astronomer had the opportunity of witnessing this rare spectacle of a heavenly body which, rushing headlong from extraplanetary depths, went directly on the sun, as if it would fall in, and notwithstanding, in a few hours delivered itself, changing completely its direction of motion. At that time the earth was placed very obliquely in respect to the arc described by the comet about the sun, so that astronomers observed it with a great foreshortening of perspective. In those hours the comet, being exposed to an extraordinary heat, swelled and became so luminous, that the Cape astronomers, and afterwards some in Europe, could see it near the sun. They could make the absolutely new observation of a comet's transit before the solar disk, thus satisfying an ancient desire of astronomers, who have wished to know if in those bodies' head, which often appears as a very bright star, is hidden an obscure perceptible nucleus, and to judge of the density of the shining atmosphere whose splendour produces the star's appearance. In this case it was not possible to be deceived by an illusion, as happened in 1819. Messrs. Finlay and Elkin, at the Cape, saw the comet gradually approach the sun's limb, touch it, and disappear; so that their searches to find the comet in the place where it obviously was were vain. The comet then was so thin and clear, that the most slender cloud would more obscure the sun: its solid nucleus (if it had a nucleus, as was very likely) was so small that the observer's telescope could not perceive any spot or shade. After it left the neighbourhood of the sun, the effects of the enormous heat began to appear in the development of that splendid tail, which everybody could see in the morning hours of October and November.

The orbit of the comet (continued the Professor) is not easily deducible from the very little portion which we know. Both because to assign a trajectory observed in a small branch is very difficult, and sometimes impossible, and because exact and definitive calculations will not be undertaken before the vanishing of the comet; the notes which at present can be given are only approximative. On observations of last September, October, and November, it was stated that the period of the comet is included between eight and nine centuries, and the aphelion is nearly six times farther than Neptune from the sun (175 times the earth's mean vector radius), the rate of velocity in aphelion and perihelion being as 1 to 23,000.

On the brightness of the comet, M. Schiaparelli observed that it could be attributed to three causes: the strong illumination of the sun, its own light, and electrical discharges, which take place continually in similar bodies, in the opinion of expert physicists. Those causes united to make that very splendid appearance of a matter clearer and less dense than the rarefied air of our best pneumatic engines. The density of the tail was so small that an astronomer estimated it at no more than a few kilogrammes, while its dimensions were larger than were ever before observed in comets. It is true that other comets (that of 1861, for example) showed an apparently longer tail, their position in respect to the earth being more favourable to observation; but in the annals of

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astronomy we have never found a comet's tail really as long as this.

I leave out the detailed description of the comet's aspect, because NATURE has given full accounts and sketches, and I come to the most interesting part of M. Schiaparelli's lecture, on the production of those magnificent phenomena. I translate literally from Signor Schiaparelli's manuscript.

The proper nucleus of the comet is a solid or liquid body so small as rarely to be seen: in the greater number of comets, as in this, it seems to be not large enough to be visible even in powerful telescopes. It seems also that in some comets there are several nuclei, very small and close, whose particular atmospheres in their development at last unite in one. As long as such a body (or system of bodies) remains far from the sun, in extraplanetary regions, where temperature is less than − 140° C. (according to the most moderate estimates), and where the sun has perhaps no power to heat it, the matter must be wholly solid or at least liquid; and, if a small quantity is gaseous or vaporous, it must have a great density and a small volume. The progressive approach to the sun by its descending orbit will obviously swell the enveloping atmosphere, or give rise to one if it does not yet exist, with materials generated by the surface. Shortly the nucleus begins to appear surrounded by a blaze of light, feeble at first, but afterwards more and more brilliant, which is the star or head of the comet. Many comets do not go beyond this first phase, both because they have not matter enough to make an atmosphere, and because they do not come near enough to the sun to be subject to a great heat. Some comets do not enter the earth's orbit, others cannot reach that of Mars, and we know that the comet of 1729 got only a little way into the orbit of Jupiter. The most part of those comets, being exposed very moderately to the solar influence, cannot increase, and remain telescopic; and it is very probable that a large number stop at Jupiter or Saturn's orbit (or even further) in their descent upon the sun: none of those are seen, and we can speak of them only by conjecture.

When a comet, however, as the present, pierces through the interior part of the planetary system, it is in the best condition to develop its atmosphere if it contain matter enough to do so. But the sun, while attracting to himself the nucleus, has the property to repel some of the matter of the atmosphere. It is not well known how and why this matter is repelled, and to expound the various hypotheses on this point would take too long a time. The effect of repulsion is nevertheless undoubted, and manifested by the fact that those parts of the cometary atmosphere, under the sun's impulse, almost as if under a gale blowing from it, leave the nucleus and fly in an opposite direction away from the sun, producing the tail, which, nourished successively by incessant evaporations of the nucleus, more and more increases in length, till the atmosphere of the nucleus, wholly repelled, overflows into the tail, and thus exhausts itself. This happens usually when the nucleus, after the perihelion, receding from the sun and being then exposed again to the cosmical cold, is no longer able to supply with new evaporations the part of the atmosphere which the tail absorbs. Deprived thus of its former envelopes, and unable to engender others, the nucleus is reduced again to itself, and the comet disappears.

The tail of the comet consists then of matters repelled by the sun with a mysterious power. But, during the above described period of conflagration, other interesting events occur in the comet. It is so much swollen and convulsed by solar heat that the little nucleus is not able sometimes to keep together the fragments by its own very feeble attraction. Violent eruptions take place at the surface, so that pieces of nucleus are raised and thrown out of the principal body's attraction. Those fragments then pass through the heavens as independent bodies, and their orbits are not very different from the orbit of the nucleus. Sometimes one of the broken pieces is great enough to engender another separate comet: that is, the several times observed phenomenon of a divided comet. But most generally it seems that separated pieces are very small and numerous, like the sparks of a piece of salt thrown on the fire; and extend along the trajectory of the nucleus like a current or projection of corpuscles, which gradually invade all the orbit of the comet. Many comets (probably all) engender in their course a similar retinue; and the planetary intervals are peopled by those corpuscles produced by a comet's partial disintegration. When the earth in its yearly revolution passes through one of these processions it meets with several pieces, which get inflamed by contact with the terrestrial atmosphere, and burn in a very short time, producing a falling star.

An example of such a process of separation was given by the present comet. In effect, a little before October 15 M. Schmidt, the astronomer at Athens, observed an irregular and very feebly shining thin cloud leaving the comet, withdrawing, and finally disappearing. It was more dense and luminous in some places than in others, but it looked not like a comet, having rather the aspect of a mass of corpuscles exploded by the principal nucleus. The atmosphere also enveloping the principal nucleus offered analogous phenomena, being not round and symmetrical, but lengthened spindle-fashion, with several more luminous centres of different intensity spread in an oval cloud. We have, besides, reason to believe that another little comet, which was observed in the beginning of 1880 in the austral regions of the earth, running in an orbit very similar, was previously separated from our great comet.

M. Schiaparelli passed afterwards to another question, on the chemical constitution of comets, explaining the principle of spectrum analysis and its application to celestial chemistry. He remarked that the present and Wells's comet only, by their coming so near the sun, could present the lines of sodium, whilst all the comets before observed gave only lines of hydrocarbons in the spectroscope; and it is very probable, according to modern theories, that comets contain also some matters which are made apparent in falling stars and in aërolites, as iron, nickel, silicium, magnesium, aluminium, and others. This confirms the induction as to the similarity of their chemical composition to that of the earth; and the common origin of comets in the planetary system is evidently proved by their accompanying the sun in its progressive movement towards the constellation of Hercules. It seems that comets belonging to the solar system would have the function of continually dissipating matter in space, as a compensation to the attractive power of the greatest centre, the sun.

Pressure of space obliges me to leave out the very eloquent conclusion of this lecture, in which the lecturer refuted the apprehensions as to the shock of a comet with the earth, and its probable consequences, discussing the great moral importance of these studies as an antidote to the fears and superstitions of ignorant people. Referring to Anaxagoras and Galileo, he concluded with these words: "A science which suffered such noble condemnations, and is able to awake such noble hopes, cannot be considered as futile and idle; it will always be dear to the friends of truth; dear to every one who is convinced that man lives not by bread alone."

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THE SOARING OF BIRDS

THE recent correspondence in NATURE upon this subject ought not to close without some reference to a possible explanation of *soaring* which does not appear to have been yet suggested.

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